

CLAIMS

What is claimed is:

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1. A method for operating a laser with a semiconductor gain region, comprising monitoring voltage across said gain region, and determining cavity losses according to said monitored voltage across said gain region.

2. The method of claim 1, further comprising adjusting a loss characteristic associated with said laser according to said monitored voltage across said gain medium.

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3. The method of claim 2, wherein said adjusting said loss characteristic comprises adjusting a loss element associated with said laser.

4. The method of claim 3, wherein said adjusting said loss characteristic comprises positionally adjusting said loss element in said cavity.

5. A method for controlling performance of a laser cavity having a beam traveling therethrough, comprising:

- (a) monitoring voltage across a gain medium emitting said beam; and
- (b) determining optical losses associated with said cavity according to said monitored voltage across said gain medium.

6. The method of claim 5, further comprising adjusting a loss characteristic of said cavity according to said monitored voltage across said gain medium.

7. The method of claim 6, wherein said adjusting said loss characteristic comprises adjusting a loss element in said cavity laser.

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8. The method of claim 7, wherein said adjusting said loss element comprises:

- (a) introducing a frequency modulation to said loss element; and

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- (b) deriving an error signal from said monitored voltage across said gain medium, said error signal indicative of propagation characteristics of said frequency modulation.

9. The method of claim 7, wherein said adjusting said loss characteristic comprises positionally adjusting said loss element according to said error signal.

10. The method of claim 7, wherein said loss element comprises an end mirror.

11. The method of claim 7, wherein said adjusting said loss element comprises:

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- (a) introducing a frequency modulation to a plurality of positional degrees of freedom of said loss element;
- (b) deriving an error signal from said monitored voltage across said gain medium, said error signal indicative of propagation characteristics of said frequency modulation to each of said plurality of positional degrees of freedom of said loss element; and
- (c) adjusting each of said plurality of positional degrees of freedom of said loss element.

12. The method of claim 11, wherein said adjusting of each said plurality of positional degrees of freedom of said loss element is carried out sequentially.

13. The method of claim 12, wherein a modulation of different frequency is simultaneously introduced to each of said plurality of positional degrees of freedom of said loss element, and said adjusting of each said plurality of positional degrees of freedom of said loss elements is carried out simultaneously.

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14. The method of claim 5, further comprising adjusting a plurality of loss elements associated with said cavity according to said monitored said voltage across said gain medium.

15. The method of claim 14, wherein said adjusting of said plurality of loss elements is carried out sequentially.

16. The method of claim 14, wherein said adjusting of said plurality of loss elements is carried out simultaneously.

17. The method of claim 15, wherein said adjusting said loss elements comprises:

- (a) sequentially introducing a frequency modulation to each said loss element; and
- (b) deriving error signals from said monitored said voltage, said error signals indicative of propagation characteristics of each said frequency modulation.

18. The method of claim 15, wherein said adjusting said loss elements comprises:

- (a) simultaneously introducing a different frequency modulation to each said loss element; and
- (b) deriving error signals from said monitored said voltage, said error signals indicative of propagation characteristics of each said frequency modulation.

19. The method of claim 8, wherein said introducing said frequency modulation to said loss element is carried out in periodic bursts.

20. The method of claim 11, wherein said introducing said frequency modulation to said plurality of positional degree of freedom of said loss element is carried out in periodic bursts.

21. A laser apparatus, comprising:

- (a) a gain medium emitting a coherent beam along an optical path;

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- (b) a reflector positioned in said optical path and defining a laser cavity; and
 - (c) a voltage sensor operatively coupled to said gain medium and configured to monitor voltage across said gain medium, said monitored voltage across said gain medium indicative of optical losses associated with said cavity.

22. The apparatus of claim 21, further comprising a control system operatively coupled to said voltage sensor and to a loss element positioned in said optical path in said cavity, said control system configured to adjust said loss element according to said monitored voltage across said gain medium.

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23. The apparatus of claim 21, further comprising a dither element operatively coupled to said loss element and configured to introduce a frequency dither to said loss element, said frequency dither detectable in said monitored voltage across said gain medium.

24. The apparatus of claim 21, wherein said loss element comprises said reflector.

25. The apparatus of claim 21, further comprising a plurality of dither elements, each said dither element operatively coupled to a corresponding positional degree of freedom of said loss element, each said dither element producing a frequency dither detectable in said monitored voltage across said gain medium.

26. The apparatus of claim 21, further comprising:

- (a) a plurality of loss elements positioned in said optical path in said cavity; and
- (b) a control system operatively coupled to said voltage detector and each said loss element, said control system configured to adjust each said loss element according to said monitored voltage across said gain medium.

27. The apparatus of claim 26, further comprising a plurality of dither elements, each said dither element operatively coupled to a corresponding one of said loss elements and configured to introduce a frequency dither to each said loss element, said frequency dither in each said loss element detectable in said monitored voltage across said gain medium.

28. A laser apparatus, comprising:

- (a) laser gain medium means for emitting a coherent beam across a laser cavity;
- (b) loss means for producing a loss characteristic, said loss means positioned in association with said laser cavity;
- (c) means for monitoring voltage across said gain medium means; and
- (d) means for determining said loss characteristic according to voltage monitored across said gain medium means.

29. The laser apparatus of claim 28, further comprising means for adjusting said loss element according to an error signal derived from said monitored voltage across said gain medium.

30. The laser apparatus of claim 26, further comprising dither means for introducing a frequency modulation to said loss element.